Telecommunications Theory

The rapid growth of telecommunications in the last 50 years has caused increased demand for radio spectrum and has generated high levels of loading in many telecommunications networks, both wireless and wireline. In response to these trends, new radio technologies have been developed and implemented to use spectrum more efficiently and effectively. To meet critical national needs for better radio communication systems, the parameters that limit network performance must be thoroughly understood, and such knowledge must be focused on improvements in the performance of existing and new networks. Tools to monitor the quality of audio and video information on communication channels also must be developed and used so that audio and video quality levels can be accurately adjusted in real time to achieve maximal quality with minimal use of available bandwidth.

To achieve these goals for the U.S. government as well as the private sector, the Institute's Telecommunications Theory Division performs research in both wireless and wireline telecommunications, seeking to understand and improve telecommunications at the most fundamental level. Strong ongoing investigations are maintained in the major areas of broadband wireless systems performance; advanced antenna designs; noise as a limiting factor for advanced communication systems; audio and video quality assessment; advanced spectrum sharing concepts; and radio propagation.

Through publications, cooperative research and development agreements (CRADAs), and interagency agreements, ITS transfers the results of its work in all these technology areas to both the public and private sector, where the knowledge is transformed into better telecommunications for the United States, new and better products for consumers and the Government, and new opportunities for economic development and growth for the economy.

Areas of Emphasis

Audio Quality Research
The Institute conducts research and development leading to standardization and industry implementation of perception-based, technology-independent quality measures for voice and other audio communication systems. Projects are funded by NTIA.

Broadband Radio Research and Propagation Measurements
The Institute conducts an ongoing program of radiowave propagation research and measurements, using the ITS Mobile Measurements Facility and the Digital Sampling Channel Probe (DSCP). Using these facilities, researchers can determine propagation conditions and impairments which affect new digital communication systems and answer questions regarding the viability of proposed radio services. The project is funded by NTIA.

Effects of Radio Channel on Networking Performance
The Institute, a recognized leader in radio channel measurement and modeling, is involved in research to assess the effects of the wireless communications channel on communications system network performance. Recent work has focused on effects of noise and interference as limiting factors in system performance. The project is funded by NTIA.

Video Quality Research
The Institute develops perception-based, technology-independent video quality measures and promotes their adoption in national/international standards. Projects are funded by NTIA.